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Saudi Arabia's development strategy:
comparative advantage vs. sustainable growth

Introduction

In almost every country, industry is the glamour sector of economic development. People look to industrial development to provide much needed employment, to generate higher individual and national income, to relieve balance of payments constraints through import substitution, to open up markets for primary products such as those from the mining and fishing sectors, to provide the country with greater economic independence, to generate new tax revenues, and to furnish an important source of national pride.¹ By and large, these hoped for benefits of industrialization are realistic — provided a country makes sensible choices.

Until recently, investment in Saudi Arabia has concentrated on infrastructure, light manufacturing and construction materials. Most of the major products in transportation, communications, health, education, electricity, and water that were initiated in the 1970s are completed or nearing completion. Since the mid-1970s, attention has centered on heavy industries, primarily in the downstream activities of the petroleum sector and on import substitution.²

In fact, one of the more intriguing question marks concerning the kingdom's development strategy centers precisely around the government's selection of industries. A steel plant, fertilizer plants, domestic and export-oriented refineries, and a series of major petrochemical complexes form the basis of the government's attempt to diversify the economy. What is the rationalization for this strategy and is all this too ambitious for a country with virtually no previous industrial experience?³ As Yannis Stournaras⁴ has recently noted, the whole rationality of this policy has been seriously questioned.

The main purpose of this paper is to examine the viability of Saudi Arabia's industrial development strategy. In doing so, we wish to determine whether any fundamental contradictions exist between Saudi Arabia's current industrial strategy — the pursuit of export oriented industrialization based on imported capital intensive investment (comparative advantage), and that of overall economic growth. Put differently, would the country be more likely to generate higher long run rates of growth through implementing a

1 Cf. Sharif S. Elmusa, "Dependency and Industrialization in the Arab World," *Arab Studies Quarterly* (Summer 1986), pp. 253-267.

2 This section is based on Robert E. Looney "Saudi Arabia's Industrialization Strategy: A Question of Comparative Advantage," in E. Kedouri, ed., *Essays on the Economic History of the Middle East* (London: Frank Cass, 1988).

3 A question also asked by Louis Turner, "Industrial Development Strategies in the Arab Gulf States," in May Ziwar-Daftari, ed., *Issues in Development: The Arab Gulf Strategy* (London, M.D. Research Services Limited, 1980), pp. 210-211.

4 Yannis Stournaras, "Is the Industrialization of the Arab Gulf a Rational Policy?" *The Arab Gulf Journal* (April 1985), pp. 21-28.

strategy of investing in less capital intensive industries oriented toward supplying the domestic market with a variety of consumer goods?

Comparative advantage

The existence of under-exploited gas reserves in the kingdom has been one of the strongest arguments for developing gas-based heavy industries. Gas — especially the dry gases, methane and ethane — is an expensive product to transport, thus making it sensible to look for more productive uses for its exploitation.

International trade theory is capable of rationalizing a gas-based industrialization strategy. For example, according to the Heckscher-Ohlin theory of international trade, a country tends to have lower comparative costs in the commodity that uses the largest amount of the relatively cheapest factor in its economy. These considerations provide the fundamental rationale for specialization.⁵ In general terms, the theory indicates that Saudi Arabia should establish and promote industries primarily based on natural gas and/or oil. These are the industries, everything else aside, that are most likely to be efficient and successful. Fortunately for the Saudis, these industries are not only energy intensive but also capital intensive. Thus, they tend to utilize its abundant financial surplus as well as gas and oil.

Once oil has been produced at an optimal rate, there is an excellent theoretical argument for developing gas intensive industries around.⁶ These can either be chemical industries, which use the gas as a feedstock for conversion into higher value and more easily transportable chemical products, or they can be energy intensive industries such as steel or aluminum production, where the gas can be used as a reasonable cheap source of energy.

Few observers would quibble with these general observations. The planners' task in identifying precisely those industries best suited for the kingdom has not been as easy as it might appear at first sight, however.

Because the country had virtually no heavy industry or industrial experience to speak of in the early 1970s, the Heckscher-Ohlin predicted pattern of trade had not been established and the price system had not developed to the point where it was capable of giving the planners the correct signals as to the best areas of investment. In addition, a number of less obvious considerations surrounding the introduction of heavy industry into the country have made it extremely difficult to design procedures capable of identifying the most effective methods of allocating the country's resources. Although financial capital may not be a constraint, especially in the short term, the kingdom has to face other constraints to industrial development. Physical bottlenecks, manpower shortages and inflation have proved to be real impediments to the absorptive capacity of the economy. In particular, the impact of these negative factors has often been most severe in the very developmental activities intrinsic to a successful diversification policy.

In sum, the Saudi government hopes that the development of heavy industry in the petrochemical sector will spawn a wide range of manufacturing activities. There are two major reasons why the kingdom can rationalize reversing the more typical experience

5 J.L. Ford, *The Ohlin-Heckscher Theory of the Basis and Effects of Commodity Trade* (New York: Asia Publishing House, 1965), ch. 1.

6 Cf. the argument given in B.I. Mohyuddin and R.Z. Karam, "Arab Petrochemicals Supply and Demand," *Arab Gulf Industries* (December 1986), pp. 8-38.

of developing light manufacturing first and heavy industry second. With 40 percent of world crude oil reserves, Saudi Arabia has the resource endowment to support an efficient petrochemical sector, and it is natural that petrochemical facilities be established to process this crude. Initially, Saudi Arabia will export most of its primary petrochemical output, but over time chemical and plastics enterprises can be established locally to process increasing proportions of primary petrochemical output. Second, with a relatively small labor force and relatively large amounts of capital (oil revenues), capital intensive operations are consistent with relative factor endowments in the kingdom.⁷

Industrial employment patterns

As noted above, industrial development in Saudi Arabia recently has entered a new phase that will shape the structure of the future Saudi economy. Since the late 1970s, attention has centered on industrial development, primarily in the downstream activities of the petroleum sector and on import substitution. Joint ventures with foreign partners were formed to utilize oil and gas as feedstock for refining and petrochemical operations. To provide the feedstocks, in 1983 the Saudis completed the first phase of the world's largest gas-gathering project. Major petrochemical plants are operational and most primary production facilities were completed by the end of 1985. With these facilities, Saudi Arabia is capable of producing between 4 and 5 percent of the world's primary petrochemical output. The features of these industrial operations and planned industrial development have emerged sufficiently to characterize the future industrial structure and industrial employment in the kingdom.

For purposes of classification, Saudi officials distinguish between six types of industries:

1. Group I includes chemicals, fertilizers, drugs and medicine, crude-oil refining, rubber products and plastic products;
2. Group II is comprised of iron and steel industries, aluminum, structural metal products, and fabricated metal products;
3. Group III industries include structural clay products, cement and cement products, and non-metallic mineral products;
4. Group IV is composed of textiles, clothing, footwear, paper products, chinaware, and glass products;
5. Group V includes furniture, machinery, equipment, consumer appliances, air conditioners, and motor vehicles;
6. Group VI encompasses food products, bakeries, ice storage and warehousing and carbonated products.

Heavy industry is characterized as primary and secondary; these designations refer both to industrial function and to the size of plants. The classification most useful for this study is by size of investment. Primary industry refers to investments greater than \$100 million; secondary industries comprise a range from \$20 million to \$100 million; and light manufacturing corresponds to investments of less than \$20 million.⁸

7 Donald Wells, "The Effects of Saudi Industrialization on Employment," *Journal of Energy and Development* (1986), pp. 274-275.

8 Wells, *op. cit.*, p. 275.

The new emphasis of Saudi industrialization (Table 1) clearly indicates that a movement toward highly capital intensive operations is underway. In all categories, for firms under construction (presumably completed by the end of 1985) capital per worker is greater than for enterprise already in operation (at the end of 1983). For primary industries in Group I, capital per worker is \$1,051,000 for operating firms and \$2,302,900 for firms under construction. For purposes of comparison, during 1976 in the United States capital per worker in 1972 dollars was \$151,000 in the petroleum sector, \$65,000 in primary metals and \$55,000 in the chemical industry.⁹

Table 1: Capital Per Worker in Saudi Arabian Industries (employment)

	Light Manufacturing	Secondary Industries	Primary Industries
Group I			
Operating	\$83 000 (8 230)	\$208 200 (1 073)	\$1 051 000 (2 268)
Under Construction	\$108 000 (3 592)	\$416 300 (588)	\$2 302 900 (5 955)
Group II			
Operating	\$47 500 (10 414)	\$149 200 (1 329)	\$437 700 (1 300)
Under Construction	\$93 000 (2 745)	\$274 100 (742)	— —
Group III			
Operating	\$55 100 (21 204)	\$116 300 (4 354)	\$714 400 (2 644)
Under Construction	\$91 900 (3 441)	\$339 400 (274)	\$944 700 (900)
Group IV			
Operating	\$43 300 (3 626)	\$75 300 (1 638)	— —
Under Construction	\$72 100 (2 367)	\$163 800 (810)	— —
Group V			
Operating	\$41 300 (15 560)	\$53 900 (2 897)	\$359 000 (446)
Under Construction	\$80 700 (5 452)	\$280 800 (672)	\$189 600 (750)
Group VI			
Operating	\$71 200 (11 200)	\$173 700 (1 315)	\$189 900 (665)
Under Construction	\$136 800 (4 230)	\$192 300 (1 066)	— —

Source: Based on Donald A. Wells, "The Effects of Saudi Industrialization on Employment", *Journal of Energy and Development* (1986), pp. 273-284

In terms of employment, the 180 percent increase in industrial investment on new projects will increase the industrial labor force by approximately 35 percent. The change in emphasis from light manufacturing to heavy industry is primarily responsible for this relatively small increase in the industrial labor force. Employment in light manufacturing accounts for about three fourths of total employment for firms in operation and almost two thirds of total employment for the firms under construction.

⁹ Wells, op. cit., pp. 277-278.

In spite of the massive investment in industry, the industrial labor force will remain a small proportion of the total labor force. The Saudi labor force in the period between 1985 and 1990 will be between 1.8 million and 2.0 million persons. The total industrial employment of approximately 125,000 will be about 7 percent of total Saudi employment.

On the other hand, it is estimated that by 1990 there will still be over 500,000 foreign workers in Saudi Arabia. More importantly, although there are no official statistics, it is clear that most workers in industry are non-Saudis.¹⁰ The reasons for the high foreign work force are largely:¹¹

1. There are many types of manual labor that Saudis prefer not to perform, either for cultural reasons or because pay levels are too low.
2. Over the near term, the lack of training has made Saudi Arabia dependent on foreigners for filling a wide range of occupations requiring managerial, engineering and technical skills. The petrochemical plants will require skills for which there are not a sufficient number of experienced Saudis. Until enough have been trained the kingdom will have to rely on expatriates to perform these functions, and the experience and expertise required will be achieved only over decades.

Growth under the Third Five Year Plan (1980-85)

An examination of the performance of the Saudi economy over the recently completed Third Five Year Plan (1980-85) provides additional insights into the impact that capital intensive, foreign technology has had on growth and employment patterns.

The Third Plan departed from its predecessors¹² in several areas. Both the first and second plans targeted high growth rates in all sectors, with a policy of allowing relatively free importation of foreign labor to satisfy manpower requirements. The Third Plan was much more selective, opting for high growth in those areas Saudi planners felt had demonstrated proven potential. Clearly implied in the plan was the country's major long term objective: containing and eventually reducing the size of the foreign labor force. In short, the plan's development strategy revolved largely around the achievement of rapid increases in productivity through imported technology sufficient not only to achieve a growth rate of slightly over 6 percent in non-oil income, but perhaps even more importantly, to reduce significantly the size of the foreign work force.¹³

In terms of results, however, the labor force increased by an average annual rate of 8.0 percent or by 1,420,000 in the Third Plan period, thus far exceeding the target rate of 1.2 percent. Interestingly enough, by the end of the Third Plan period government civilian employment had declined from 13.2 percent of total employment to 10.5 percent. The service sectors, trade and financial services experienced the most significant growth in their shares of total employment.

¹⁰ Wells, op. cit., p. 281.

¹¹ Wells, op. cit., p. 280.

¹² For a detailed description of these, see Robert E. Looney, *Saudi Arabia's Development Potential* (Lexington, Mass.: Lexington Books, 1982).

¹³ Robert E. Looney, "Socio-economic Tradeoffs in Saudi Arabia's Third Five Year Plan"; *Socio-Economic Planning Sciences* (1986), pp. 181-192.

However, while total employment expanded rapidly during the Third Plan period, the Saudi component of this growth accounted for only 292,800 or approximately 21 percent. The Saudi labor force grew at an average annual rate of 3.7 percent, compared to the non-Saudi growth rate of 11.8 percent. The net result of these developments was the share of Saudis in the total labor force declining from 49.4 percent in 1980 to 40.2 percent in 1985.¹⁴ Furthermore, in spite of the relative decline in government employment, productivity declined significantly during the Third Plan period (Table 2). Over the entire period, productivity declined at an average annual rate of 2.7 percent.

Table 2: Rate of growth

	Value Added non-oil gdp	Employment	Productivity (value added / employment)
1981	10.9	14.3	-2.9
1982	10.8	12.8	-1.8
1983	8.6	11.8	-2.8
1984	6.9	11.0	-3.7
1985	5.1	8.0	-2.7

Generalizations concerning Saudi Arabian industrialization

These trends, together with several recent assessments¹⁵ of Saudi industrialization suggest that:

1. Investments have been largely in projects seeking to utilize locally available raw materials. Basic industries have been created in isolation without the vital intermediate and transsectoral industries which in time might allow the growth of a self-perpetuating industrial base.
2. Industrial development began as a function of factors unrelated to the socio-economic reality of the kingdom. It depended mainly on the need to use the flared associated gas and accumulating capital. As a result, the pace of the process of industrialization was dictated by external conditions and not by the needs and capabilities of domestic society. This led to heavy dependence on foreign manpower, expertise, management and technology.
3. Sudden easy access to wealth created a consumer-oriented society in which the relationship between productivity and reward largely disappeared. Many investment decisions were based on overly optimistic economic assumptions. The decisions were often speculative rather than based on long term economic viability. In other words, technology was selected on the basis of extrapolated factor endowments which assumed continued high oil revenues and not on an assessment of the country's long run sustainable factor proportions. The post-1982 oil revenue decline significantly changed the relative factor proportions from those in existence after 1973 / 74.¹⁶

14 Kingdom of Saudi Arabia, Ministry of Planning, Fourth Development Plan: 1985-1990 (Riyadh, Ministry of Planning, 1985), p. 31.

15 Cf. Robert E. Looney, "Saudi Arabia's Industrialization Strategy: A Question of Comparative Advantage," in E. Kedourie, ed., *Essays on the Economic History of the Middle East* (London: Frank Cass, 1988); and Muhammad Abd al-Shafi, "Industrial Development in the Persian Gulf," *The Jerusalem Quarterly* (1986), pp. 140-144.

16 Abdulla H. al-Moajil, "Transfer of Technology: Reflections on the Arab Gulf Industrial Experience," *Arab Gulf Industry* (August 1986), p. 8.

Abundant supplies of capital have made it easier for Saudi Arabia to acquire modern forms of Western technology. However, in reality there are a number of factors that have negated these advantages.

1. Because of a limited supply of skilled labor, the kingdom was forced to adopt a development strategy based on capital as a substitute for labor. This heavy reliance on capital intensive technology, in turn, further increases the technological dependence on Western countries.
2. The very complexity of modern technology aggregates this situation by creating a dependency on increased foreign technicians.
3. The preference for packed technology (turn-key projects) along with elite skilled labor, technicians, and managers as part of contract agreements, though allowing a prompt and perhaps more efficient execution of contracts, seldom enables the nationals to acquire work experience and training.¹⁷

These patterns suggest capital may not be a sufficient condition for productive investment in the kingdom due to the limited absorptive capacity of the non-oil related productive sectors. The net result of these developments has been the creation of an industrial sector incapable of meeting local demands for consumer goods. Slack petrochemical export markets (due to world excess capacity) together with the post-1982 decline in oil revenues and high levels of aggregate demand (facilitated and sustained by oil revenues) have, due to the underdevelopment of local consumer goods industries, placed double pressure on the country's balance of payments. Since 1983 Saudi Arabia's current account deficit has been second only to that of the United States. During this period, the country's external investments have declined from approximately \$150 billion to less than \$70 billion in order to support the population's high level of consumption.

In short, it is possible to argue that many of the country's current economic problems lie not in a lack of capital supply so much as in the inability of the economy to locally manufacture consumer goods.¹⁸

Ultimately the issue of whether or not Saudi Arabia should have focused more attention on developing industry oriented to the domestic market can not be resolved without detained microeconomic studies of economies of scale in consumer goods production, i.e. is the Saudi market (and possibly that of the Gulf Cooperation Council) large enough for the establishment of optimal sized plants.¹⁹

On the other hand forecasts of overall consumer demand should shed some light on the wisdom of a general shift of industrial production toward serving the domestic market. The next section therefore examines the consequences of several different government fiscal strategies in light of likely developments in the oil markets over the period up to 1992. Based on the associated growth paths of private consumption and industrial output, several implications are drawn for the industrial policy most consistent with sustained growth.

¹⁷ Mostafa H. Nagi, „Dimensions of Dependency in Oil Rich Countries,“ *The Arab Journal of the Social Sciences* (October 1986), pp. 181-182.

¹⁸ M.H. Nagi, „Development With Unlimited Supplies of Capital: The Case of OPEC,“ *The Developing Economies* (March 1982), p. 11.

¹⁹ See for example M.M. Metwally, „Market Limitation and Industrialization in Arab Countries,“ in J.K. Bowers, ed., *Inflation, Development and Integration: Essays in Honour of A.J. Brown* (Leeds: Leeds University Press, 1979), pp. 149-172.

In order to address the issues raised above, we are particularly interested in determining, given the current slack in oil markets, whether the Saudi government will be able to sustain (and if so under what conditions) expansion in private sector activity.

For this purpose a macroeconomic model of the economy was constructed and linkages between the overall rate of economic growth and public budgetary allocations established. Finally the pattern of private sector activity was forecast through several optimal control simulations. These allocations are checked in terms of their consistency with the country's likely overall level of foreign assets and the government's concern with maintaining a safe level of national security through continued high budgetary allocations to defense.

In particular, we were interested in determining how sensitive and reliant the various private sector activities — manufacturing, agriculture and the like — are on varying levels of government expenditures. Is the private sector likely to experience sustained expansion in an era of relative government fiscal austerity?

Government expenditures and private sector activity

Public spending was the principal factor in the kingdom's remarkable boom decade which ended in 1983. To a great extent, growth continues to depend on the flow of funds through the government, but the volumes being disbursed at present (1987) are about 36 percent less than the 1982 peak (Table 3).²⁰

Table 3: Actual Revenue and Expenditure (Billion Riyals)

	1982	1983	1984	1985	1986
Total Revenue	386.0	246.2	206.4	171.5	131.5
Oil Revenue	328.6	186.0	145.1	121.3	87.7
Other Revenue	39.4	60.2	61.3	50.2	43.8
Total Expenditure	236.6	244.9	230.2	216.4	181.5

This has been reflected in the level of output. Gross domestic product (GDP) at constant prices was more than 24 percent lower in 1986 than in 1982 when national production was at its highest. In terms of individual sectors the contraction in output has been even more spectacular (Table 4).²¹

Table 4:

	Rate of Growth 1982 - 86	Rate of Growth 1986
Agriculture	12.2 %	13.0 %
Mining	- 4.4	- 3.3
Non-oil Manufacturing	4.0	- 9.8
Construction	-12.6	-20.0
Wholesale and Retail Trade	- 0.5	-11.7
Transport and Communication	1.4	-11.8
Ownership of Dwellings	- 3.5	-10.0
Finance	- 5.2	-15.7
Services	0.0	- 3.9

²⁰ Data are from Saudi Arabian Monetary Agency, Annual Report 1406 (1986), Research and Statistics Department, 1987, p. 30.

²¹ Data are from Saudi Arabian Monetary Agency, Annual Report 1406 (1986), Research and Statistics Department, 1987.

This has prompted a debate in the kingdom as to how the economy can be encouraged to develop and expand. Some sections of the business community have been lobbying the government to increase its overall level of expenditure to help restore growth. In turn officials have been asking why the private sector, one of the most liquid and wealthy in the developing world is not doing more to help the process.

Attention has also been drawn to the role of the kingdom's financial institutions and what they have been doing to direct the nation's savings into productive projects. Figures for 1986 show that domestic lending by 8 of the kingdom's 11 commercial banks fell by up to 25 percent over the previous 12 months.

Description of the model

The model constructed below is an econometric time series model, which was designed to utilize as much as possible the available Saudi Arabian national accounts statistics and fiscal statistics.²² It aims at explaining the structural changes in the Saudi Arabian economy particularly those during the 1970s and 1980s, as well as projecting values for the key macroeconomic variables and their link with budgetary expenditures over the 1986-92 period.

The model contains both monetarist and Keynesian elements, variations of which have been developed for various countries.²³

Ordinary least squares regression was used in the exploratory stage of model building, when much experimentation with various possible explanatory variables was undertaken to decide on the choice of variables and the form of the structural equations included. However, two stage least squares technique was later used for the final estimations of parameters of the model to correct for any simultaneous equation bias in the estimates.²⁴ The estimation procedure was carried out using the national account statistics for the years 1960-85 and the sectoral figures for the years 1965-85. The national account and budgetary figures were deflated using the non-oil GDP deflator (1970 = 1.0). The model developed below is a simple simulation model, designed to incorporate the possibilities of both discretionary and non discretionary policy alternatives. The first stage of the model — the monetary block — contains 13 equations.²⁵ The main features of the model include (Table 5):

1. The money supply is a direct function of government expenditures (equation 8, Table 5).
2. Non-oil gross domestic product is estimated by a quantity theory type function whereby the growth in real non-oil income is assumed dependent on the rate of

22 Data were taken from: International Monetary Fund, International Financial Statistics Yearbook, various issues; and the Saudi Arabian Monetary Agency, Annual Report, various issues.

23 A description of the validity of this type of model is given in Robert E. Looney, „Pre-revolutionary Iranian Economic Policy Making: An Optimal Control Based Assessment“, *Economic Modelling* (October 1985), pp. 357 - 368. A similar model dealing with the Mexican economic crisis is developed in Robert E. Looney, *Economic Policy Making in Mexico: Factors Underlying the 1982 Crisis* (Durham, North Carolina: Duke University Press, 1985).

24 Cf. Ray C. Fair, *Specification, Estimation and Analysis of Macroeconomic Models* (Cambridge: Harvard University Press, 1984), ch. 2 for a rationale for this approach. Estimations were made using the TSP program developed at Stanford University. See B. Hall and R. Hall, *Time Series Processor, Version 3.5 User's Manual* (Stanford, California: B Hall and R. Hall, 1980) for a description of the estimation procedure.

25 The equations were estimated using two stage least squares estimations to eliminate any possible simultaneous equation bias. Nominal exports, the rate of world inflation and the euro interest rate were assumed exogenous to the system.

Table 5: Saudi Arabia: Monetarist Macroeconomic Simulation Model
(Two-stage least squares estimations)

(1)	Growth in Oil Revenue (GGROX) = 0.85 GEN + 0.49 GENL (69.27) (11.83)
(2)	Growth in Non-oil Revenue (GNOR) = 0.83 GGROX (2.6)
(3)	Growth in Government Revenue (GGRX) = 0.89 GGROX + 0.06 GNOR (9.37) (2.09)
(4)	Growth in Monetary System Foreign Assets (GMSFA) = 1.20 GGROX (8.37)
(5)	Growth in Commercial Bank Credit to the Private Sector (GCBPS) = 0.45 GGEX + 0.15 GMSFA (2.28) (1.94)
(6)	Growth = Government Deficit (GGDEF) = GGRX - GGEX
(7)	Growth = Government Expenditures, National Accounts (GGENAN) = 0.48 GGEX + 0.29 GGENANX + 0.15 GGROX (2.83) (1.98) (2.06)
(8)	Growth in Money Supply (GMIX) = 5.71 + 0.38 GGEX + 0.27 GGEXL (2.04) (4.88) (3.68)
(9)	Inflation; Non-oil GDP Deflation (INFN) = 0.58 GMIX + 0.38 INFNL - 0.45 GYX (5.94) (1.96) (-2.14)
(10)	Growth in Real Non-oil GDP (GYX) = 0.62 GMIX + 1.04 GVMIX - 0.68 INFC (4.87) (2.81) (-1.79)
(11)	Inflation; Consumer Price Index (INFC) = 0.25 GMIX - 0.38 INFN (5.47) (2.10)
(12)	Growth in Velocity of Money (GVMIX) = 0.32 EUROR + 0.18 INFNE (2.11) (2.09)
(13)	Expected Inflation (INFNE) = INFNL - INFNL 2
Exogenous Variables, World Inflation (INFW), Real Euro Interest Rate (EUROR), Exports (GEN)	

Note: L indicates lagged 1 year, L2 indicates lagged 2 years

money supply, the rate of growth in velocity and inversely to the consumer price index (equation 10, Table 5).

3. Inflation is dependent on the growth in money, world imported inflation and (in the case of the non-oil GDP deflator) growth in income (equations 9 and 12, Table 5).
4. The velocity of money (M1) increases with increased opportunity cost of holding money (as proxied by the euro interest rate and the expected rate of inflation).

In short, the model links the money supply with government expenditures. The growth in real non-oil GDP was in turn determined by the overall growth in the money supply, and any increase in the velocity of money. The stability of velocity (and hence the validity of the quantity model used here) was confirmed by the fact that regressions of the growth of money on the growth of velocity were not statistically significant.

The second stage of the model, the real (current price) expenditure and private sector block (Table 6) contains 17 equations in all. These consist of expenditure, private sector output, and identity equations. The transition from the monetary (current price) model was made by deflating government expenditures, commercial bank credit and the money supply by the non-oil GDP deflator. One of the main features of the private sector output section of the model was the systematic incorporation of military expenditures into a number of the private sector output relationships. A priori it was not clear whether the government's high allocations to defense decreased the amount of resources available for private sector activity through preempting resources for military activities or stimulated private sector activity through demand linkages.

Table 6: Saudi Arabia: National Income and Sector Output Simulation Model
(Constant 1970 riyals) (Two-stage least-squares estimation)

(1)	Government Consumption (GCNP) = 0.20 GEXP + 0.60 GCNPL	(5.04)	(6.25)
(2)	Government Investment (GINP) = 0.22 GEXP	(30.70)	
(3)	Total Government Expenditures-National Income Accounts (GENANP) = GCNP + GINP		
(4)	Private Consumption (PCNP) = 0.60 PCNPL + 0.09 GEXP + 0.23 CBPSP	(3.01)	(2.36) (2.10)
(5)	Private Expenditure (PENANP) = PCNP + PINP		
(6)	Defense Expenditure (SIPRIP) = 0.46 GENANP	(46.96)	
(7)	Agricultural Credit (AGCRP) = 0.0134 GENANP	(10.12)	
(8)	Agricultural Output (AGP) = 0.97 AGPL + 0.42 AGCRP	(22.61)	(2.76)
(9)	Mining Output (MINP) = 0.31 MINPL + 0.0057 GINP - 0.011 SIPRIP	(1.77)	(2.40) (3.15)
(10)	Non-oil Manufacturing (MUP) = -0.455 SIPRIP + 0.82 PENANP	(-2.38)	(8.66)
(11)	Construction (CP) = 0.46 GCPL + 0.14 GINP + 0.16 SIPRIP + 0.62 D75X + 0.04	(9.27)	(5.63) (3.91) (2.57) (2.10)
(12)	Transportation/Communication (TSCP) = 0.29 TSCPL + 0.24 MIP - 0.93 D75 + 0.31	(4.04)	(7.84) (-6.73) (4.04)
(13)	Wholesale-Retail Trade (WTP) = 0.68 WTPL + 0.084 SIPRIP + 0.049 MIP - 0.37 D75 + 0.07	(9.15)	(4.06) (2.05) (-2.91) (3.10)
(14)	Services (CDP) = 0.03 SIPRIP + 0.04 PCNP	(2.13)	(3.70)
(15)	Finance (FOP) = 0.62 FOPL + 0.07 MIP	(5.63)	(2.77)
(16)	Ownership of Dwellings (FODP) = 0.07 SIPRIP + 0.17 PINP + 0.33	(2.41)	(2.43) (5.85)
(17)	Private Sector Output (YP) = AGP + MINP + MOP + CP + TSCP + WTP + CDP + FOP + FODP		

Variables from Monetarist simulation model: Government Expenditures (GEXP) Money Supply (MIP), Commercial Bank Credit (CBPSP)

Dummy Variables: D 75, D75X

Note: L indicates lagged one year

The record shows that Saudi Arabia's expenditures for its defense and security forces have increased at an annual average rate of about 25 percent in nominal terms and 16 percent in real terms between 1960 and 1985.²⁶ Military spending has averaged about 44 percent of total public spending in recent years, with defense expenditures apparently more immune to budgetary cuts than, for example, government investment.

Empirically, it appears (Table 6) that increased defense expenditures have tended to have a negative impact on non-oil manufacturing, while stimulating mining, construction, wholesale and retail trade, services and the income derived from ownership of dwellings. The overall net impact of military expenditures on private sector output (not shown here) was also positive and statistically significant.²⁷

26 Data are taken from the Stockholm International Peace Research Institute, World Armaments and Disarmament, SIPRI Yearbook (Philadelphia: Taylor and Francis), various issues. Excellent accounts of Saudi military expenditures are given in Nadar Safran, Saudi Arabia: The Ceaseless Quest for Security (Cambridge, Mass.: Harvard University Press, 1985), particularly ch. 7 and 17. See also Anthony Cordesman, "Defense Planning in Saudi Arabia," in Stephanie Neuman, ed., Defense Planning in Less-Industrialized States (Lexington, Mass.: Lexington Books, 1984), pp. 67-94; and Elizabeth Skons and Rita Jullberg, "World Military Expenditure," in Stockholm International Peace Research Institute, World Armaments and Disarmament, SIPRI Yearbook, 1984 (Philadelphia: Taylor and Francis, 1984), pp. 104-108.

27 For a full description of these and related results see Robert E. Looney, "Impact of Defense Expenditures on the Saudi Arabian Private Sector," Journal of Arab Studies (Fall 1987).

Since the model was designed largely for the purpose of examining the impact of government fiscal activity under alternative fiscal programs (associated with an assumed set of developments in the hydrocarbon sector), a relatively large number of public policy variables appear in the final estimated equations. More specifically, the model formulation allows the problems of government deficits, portfolio depletion and public private expenditure balance to be examined within the context of a set of simultaneous equations. Total government expenditures were assumed to be the main policy variable at the disposal of the authorities.

As noted, in estimating the parameters of the model time series observations covering the period 1960-85 were utilized. The first part of this period can be characterized as an environment of fairly steady if not spectacular growth and the second half by significant structural changes in the government's revenue and expenditure patterns. As might be imagined this period is characterized by an environment of high but extremely erratic growth patterns. Consequently, uncorrected for structural change, it is possible that some of the parameter estimates derived from regressions for the period as a whole would provide a description of what happened in the economy during this period only in an average sense.

To correct for the structural shifts in the 1970s and 1980s, a number of dummy variables were introduced in each of the estimated equations.²⁸ As noted above, several of the dummy variables — D75 and DX75 — were statistically significant in several of the simulation equations. The first dummy, D75 is a simple shift dummy, assuming historical values of 0 for the period 1960-74 and 1 for the period 1975 to 1985. The dummy DX75 assumed values of 0 for the period 1960-74, 2 for the period 1975 to 1982 and 1 for the period 1983-85. The first dummy is a simple shift dummy reflecting the structural change that took place in 1974-75 as a result of the oil price increases, the second dummy is a bit more subtle in that it also takes into account the post-1982 oil revenue decline experienced by the kingdom. Both dummies assumed values of 1 for the forecast period. With regard to oil revenues our assumption of slack oil markets in the late 1980s with firming up occurring in the early 1990s implies rates of growth in oil revenues of the following magnitudes: -16.0 percent 1986, -8.0 percent 1987, -4.0 percent 1988, 0.0 percent 1989, +2.0 percent 1990, +4.0 percent 1991, and +6.0 percent 1992.²⁹

28 The dummy variables were introduced to determine the nature of the structural change, i.e. did oil revenue increases in the 1970s result in shifts in the intercept of the regression and/or changes in the slope of the regression equation. The shifts associated with increased oil revenues represent quantum changes in expenditures, while changes in the slope of the regression equation are indicative of the country's absorptive capacity for increased oil revenues. See Ragaei El Malakh and Mihssen Kadhim, "Absorptive Capacity, Surplus Funds, and Regional Capital Mobility in the Middle East," *Rivista Internazionale di Scienze Economiche e Commerciali* (April 1977), pp. 308-327, for a description of this methodology. See also Robert E. Looney, "Absorptive Capacity of the Prerevolutionary Iranian Economy," *The Journal of Energy and Development* (Spring 1983), pp. 319-340; and Robert E. Looney, "The Impact of Petroleum Exports on the Saudi Arabian Economy," in Robert W. Stookey, ed., *The Arabian Peninsula* (Stanford, California: Hoover Institution Press, 1984), pp. 37-64 for applications of this methodology.

29 See Robert E. Looney, "Saudi Arabian Budgetary Dilemmas in an Era of Slack Oil Revenues," *Middle Eastern Studies* (1988) for a description of the assumptions underlying these forecasts.

As noted, the model is driven by the values assigned to variables assumed to be exogenous to the Saudi Arabian economy and a policy variable, the growth in government expenditures given specified annual deficits. In terms of exogenous variables:

1. World inflation is set at 2.0 percent per annum.
2. The euro interest rate is held constant at 7.0 percent.
3. The exchange rate is set at SR 3.745 per US- $\text{\$}$.

A fixed exchange rate is assumed since the kingdom cannot gain much short run stimulus from any exchange depreciation — the price of oil is set in US dollars and non-oil exports are unlikely to be significantly stimulated by devaluation. Furthermore, devaluation might set off an inflationary spiral, a situation the government wants to avoid at all costs. In order to stabilize the exchange rate at the current 3.745 figure, the simulations below assume that there is some inflation barrier such that, if the country is able to keep price increases below this amount, authorities will be able to maintain the par value of their currency with the dollar.³⁰ The maximum rate of domestic inflation consistent with the maintenance of a stable exchange rate was set at 5.0 percent per annum. Admittedly, this is an arbitrary figure, however, it was assumed that given the assumption of world inflation at 2.0 percent rates over 5.0 percent would eventually result in a significantly overvalued Riyal.

Optimal control forecasts

As noted above, a series of optimal control³¹ simulations of the economy were performed in an effort to determine the sensitivity of the forecasts to alternative fiscal programs. In all the simulations, the model was set to optimize the level of real private sector output in 1992. The loss function was inflation, i.e., the optimal control model steered the economy on a path over time that resulted in a minimal rate of inflation consistent with the values of the government's policy variables. As noted above, the chief policy variable (the design variable in optimal control terminology) assigned to the Saudi authorities was the increase in government expenditures under alternative deficit constraints.

Given these parameters, optimal control forecasts were structured to examine the consequences of alternative fiscal programs:

30 Cf. John Bilson, "Leading Indicators of Currency Devaluation," *Columbia Journal of World Business* (Winter 1979), pp. 62-76 for the rationale underlying this assumption.

31 The program utilized for the optimal control exercises is a modified version of that developed by G. Vanderplaats at the Naval Postgraduate School, Monterey, California. Documentation is given in G. Vanderplaats, *COPEs — A Fortran Control Program for Engineering Synthesis*, paper presented at the ASME Winter Annual Meeting, New York (1976). The economic theory of optimal control is developed in G. Chow, *Analysis and Control of Dynamic Economic Systems* (New York: John Wiley and Sons, 1975); and R. Pindyck, *Optimal Planning for Economic Stabilization: The Application of Control Theory to Stabilization Policy* (Amsterdam: North Holland, 1973). A previous application to Saudi Arabia is given in Robert E. Looney, "Socio-Economic Tradeoffs in Saudi Arabia's Third Five Year Plan (1980-85), *Socio-Economic Planning Sciences* (1986), pp. 181-192.

Table 7: Saudi Arabia: Macroeconomic Forecasts, 1986-1992, Alternative Fiscal Strategies, Budget Deficits, Fluctuating Oil Markets (Million 1970 riyals)

	Actual 1985	Forecast							Average Annual Growth 1985-1992
		1986	1987	1988	1989	1990	1991	1992	
Budget Deficit: \$10 billion range	-11.98	-12.10	-10.00	-9.94	-10.00	-9.91	-10.00	-10.00	-71.91*
Government Budgetary Expenditures (current riyals)	216.0	178.8	152.5	144.4	142.6	144.01	148.7	156.1	4.5
Total Government Expenditures	27.1	25.3	22.8	21.4	20.6	20.2	20.2	20.5	-3.9
Government Consumption	19.5	18.2	16.6	15.4	14.6	14.2	14.1	14.2	-4.4
Government Investment	7.5	7.1	6.3	6.0	5.9	6.0	6.1	6.3	-2.5
Military Expenditures	12.1	11.6	10.6	9.9	9.9	9.3	9.3	9.4	-3.5
Total Private Expenditures	30.1	30.4	29.7	28.8	28.1	27.6	27.5	27.6	-1.2
Private Consumption	25.8	4.1	23.6	23.0	22.6	22.3	22.3	22.6	-0.7
Private Investment	6.5	6.3	6.1	5.8	5.5	5.3	5.1	5.1	-3.2
Private/Government Expenditures	1.11	1.20	1.30	1.35	1.36	1.37	1.36	1.35	2.8
Inflation (Non-Oil Price Deflator)	-1.98	-6.81	-3.25	-1.47	-0.23	0.39	1.06	1.51	-
Money Supply (M1)	14.1	13.3	12.3	12.0	11.9	12.0	12.1	12.3	-1.91
Non-Oil GDP	34.3	33.2	31.7	31.7	32.0	32.6	33.4	34.3	0.0
Government Revenue (current riyals)	171.5	133.5	111.5	107.1	105.2	107.8	111.3	118.7	-5.1
Budget Deficits \$15 billion range	-11.98	-12.00	-12.00	-14.32	-14.48	-14.67	-14.31	-14.43	-96.24
Government Budgetary Expenditures (current riyals)	216.0	178.4	160.0	160.8	159.4	162.9	165.0	172.7	-3.1
Total Government Expenditures	27.1	25.2	23.3	22.5	22.0	21.7	21.8	22.1	-2.9
Government Consumption	19.5	18.1	16.8	16.0	15.5	15.2	15.1	15.3	-3.4
Government Investment	7.5	7.1	6.5	6.5	6.5	6.6	6.6	6.8	-1.4
Military Expenditures	12.1	11.6	10.7	10.4	10.1	10.0	10.0	10.2	-2.4
Total Private Expenditures	30.1	30.5	30.0	29.3	28.9	28.6	28.6	28.8	-0.6
Private Consumption	23.8	24.1	23.7	23.4	23.2	23.1	23.1	23.4	-0.2
Private Investment	6.4	6.3	6.1	5.9	5.7	5.5	5.4	5.4	-2.4
Private/Government Expenditures	1.11	1.21	1.29	1.30	1.21	1.32	1.31	1.30	2.3
Inflation (Non-Oil Price Deflator)	-1.98	-6.87	-2.08	-3.30	-0.15	0.66	0.69	1.49	-
Money Supply (M1)	14.1	13.2	12.6	12.6	12.5	12.6	12.7	12.9	-1.3
Non-Oil GDP	34.3	33.1	32.1	32.8	33.3	33.8	34.4	35.4	0.5
Government Revenue (current riyals)	171.5	133.5	115.1	107.1	105.2	107.8	111.3	118.7	-5.1

* Notes: See text for oil market assumptions. Indicates summation over 1986-1992 period

Table 8: Saudi Arabia: Private Sector Viability, 1986-1992, Alternative Fiscal Strategies, Budget Deficits, Fluctuating Oil Markets (Billion 1970 riyals)

	Actual 1985	Forecast							Average Annual Growth 1985-1992
		1986	1987	1988	1989	1990	1991	1992	
High Budget Deficits (billion \$)	-11.98	-12.10	10.00	-9.94	-10.00	-9.91	-10.00	-10.00	-71.91
Private Sector Output	26.46	25.34	24.10	23.14	22.52	22.17	22.07	22.22	-2.5
Agriculture	1.78	1.85	1.93	1.99	2.04	2.09	2.13	2.18	2.9
Mining	0.24	0.23	0.21	0.22	0.21	0.21	0.21	0.21	-1.9
Manufacturing	1.99	1.98	1.96	1.92	1.87	1.85	1.83	1.84	-1.1
Construction	7.53	6.98	6.43	6.04	5.79	5.65	5.61	5.64	-4.0
Wholesale-Retail Trade	4.71	4.62	4.42	4.21	4.04	3.91	3.83	3.80	-3.0
Transportation	3.96	3.76	3.46	3.30	3.24	3.23	3.27	3.33	-2.4
Services	1.40	1.25	1.19	1.15	1.12	1.11	1.22	1.12	-3.1
Ownership of Dwellings	2.35	2.21	2.10	2.00	1.92	1.87	1.86	1.85	-3.4
Finance & Banking	2.43	2.43	2.37	2.31	2.27	2.24	2.23	2.25	-1.1
Credit to Private Sector	10.09	9.57	8.94	8.73	8.67	8.70	8.80	8.98	-1.7
Commercial Bank	0.40	0.34	0.31	0.29	0.28	0.27	0.28	-5.0	
Agricultural Credit									
Deficit Reduction Program (billion \$)	-11.98	-12.00	-12.00	-14.32	-14.48	-14.67	-14.34	-14.43	-96.24*
Private Sector Output	26.46	25.43	24.31	23.76	23.37	23.19	23.16	23.37	-1.8
Agriculture	1.78	1.86	1.93	2.00	2.06	2.11	2.17	2.22	3.2
Mining	0.24	0.25	0.24	0.23	0.23	0.22	0.22	0.23	-0.6
Manufacturing	1.99	1.98	1.97	1.94	1.91	1.90	1.89	1.90	-0.7
Construction	7.53	6.98	6.49	6.22	6.05	5.96	5.93	5.97	-3.3
Wholesale-Retail Trade	4.71	4.62	4.45	4.31	4.18	4.10	4.04	4.03	-2.2
Transportation	3.96	3.75	3.52	3.47	3.44	3.44	3.47	3.53	-1.6
Services	1.40	1.25	1.21	1.18	1.17	1.15	1.15	1.18	-2.4
Ownership of Dwellings	2.35	2.21	2.11	2.05	2.00	1.97	1.95	1.96	-2.6
Finance & Banking	2.43	2.43	2.39	2.36	2.34	2.33	2.33	2.35	-0.5
Credit to Private Sector	10.09	9.52	9.02	8.92	8.87	8.90	8.98	9.15	-1.4
Commercial Bank	0.40	0.34	0.31	0.30	0.29	0.29	0.29	0.30	-4.0
Agricultural Credit									

* Notes: See text for oil market assumptions. Indicates summation over the 1986-1992 period

1. Annual budget deficits in the \$10 billion range;
2. Annual budget deficits in the \$15 billion range;
3. Slow deficit reduction program — deficits slowly reduced to a balanced budget by 1992;
4. Rapid budget reduction program — deficits rapidly reduced to \$5 billion by 1989 and eventually eliminated by 1990;
5. A high budget deficit program (presumably involving external public borrowing of around \$100 billion over the 1987-92 period;
6. A balanced budget each year over the 1987-92 period.

Given these assumptions, the final (and most likely to actually occur) optimal control forecasts indicate (Tables 7 and 8) that:

1. The optimal path of the economy to the year 1992 occurs with an accumulated deficit of around \$70 billion. Deficits in this range would assure that real (constant price) non-oil GDP would not contract. At the same time, however, real private sector output would decline at an average annual rate of 2.5 percent. Because the construction sector contracts at an average rate of 4.0 percent, most of the other sectors show modest reductions (agriculture actually increases at an average annual rate of 2.9 percent per annum).
2. Increasing the budget deficits to the \$15 billion per annum range would involve running an accumulated deficit of approximately \$96 billion. This added deficit would increase the rate of growth of non-oil GDP from 0 to 0.5 percent per annum. Private sector output would still decline, but at an average annual rate of only 1.8 percent per annum. In other words, risking dangerously low levels of foreign assets and/or the necessity of foreign borrowing would seem to pay relatively low returns in terms of obtaining major improvements in the rate of expansion in private sector activity.

Rather than risk dangerously low levels of foreign asset holdings, the Saudi government might opt for a strategy of balancing the public sector budget by the early 1990s. The advantages of this strategy would be largely political — assuring the local business community that the government was able to manage the economy in a period of crisis. The religious community would also probably welcome this move as a sign the government was not committed to modernization at all cost. In addition public laws prohibiting government borrowing would not have to be overturned (thus opening up fears of a renewal of the fiscal abuses of the 1950s).

The ramifications of the two logical budget deficit programs were examined (Tables 9 and 10) in the context of their impact on the private sector. The first — „Slow Deficit Reduction Program“ fiscal strategy constrained budget deficits between \$15 and \$13 billion in 1986, \$13 and \$11 billion in 1987, \$12 and \$10 billion in 1988, \$10 and \$8 billion in 1989, \$8 and \$6 billion in 1990, \$6 and \$4 billion in 1991, and a balanced budget in 1992. The second — „Rapid Deficit Reduction Program“ fiscal strategy constrained budget deficits between \$25 and \$20 billion in 1986, \$15 and \$12 billion in 1987, \$10 and \$8 billion in 1988, \$5 and \$2 billion in 1989, with balanced budgets in 1990, 1991 and 1992. In general:

1. The accumulated (1986-92) deficits of the slow deficit reduction and rapid deficit reduction program are \$56 and \$45 billion respectively.
2. Interestingly enough, both programs are associated with the same contraction in non-oil GDP of 1.2 percent per annum. However, private sector output contracts at

Table 9: Saudi Arabia: Macroeconomic Forecasts, 1986-1992, Alternative Fiscal Strategies, Balanced Budget Target, Fluctuating Oil Markets (Billion 1970 riyals)

	Actual 1985	Forecast							Average Annual Growth 1985-1992
		1986	1987	1988	1989	1990	1991	1992	
Slow Deficit Reduction Program (billion \$)	-11.98	-13.09	-11.39	-10.12	-8.42	-7.57	-5.87	0.00	-56.46*
Government Budgetary Expenditures (current riyals)	216.0	182.5	157.8	145.1	136.7	135.3	133.3	118.7	-8.2
Total Government Expenditures	27.1	25.5	23.2	21.6	20.3	19.6	19.1	17.9	-5.8
Government Consumption	19.5	18.3	16.8	15.5	14.6	13.9	13.5	12.8	-5.8
Government Investment	7.5	7.2	6.4	6.1	5.8	5.7	5.7	5.2	-5.1
Military Expenditures	12.1	11.7	10.7	9.9	9.4	9.0	8.8	8.3	-5.2
Total Private Expenditures	30.1	30.6	29.9	28.9	28.0	27.4	26.9	26.3	-1.9
Private Consumption	23.8	24.2	23.8	23.0	22.5	22.1	21.9	21.5	-1.4
Private Investment	6.4	6.4	6.1	5.8	5.5	5.2	5.0	4.8	-4.0
Private/Government Expenditures	1.11	1.20	1.29	1.34	1.38	1.40	1.41	1.47	4.1
Inflation (Non-Oil Price Deflator)	-1.98	-6.36	-2.98	-2.18	-1.35	-0.11	-0.24	-2.66	-
Money Supply (M1)	14.1	13.4	12.5	12.0	11.7	11.6	11.5	10.9	-3.6
Non-Oil GDP	34.3	33.4	32.0	31.8	31.6	31.9	32.2	31.5	-1.2
Government Revenue (current riyals)	171.5	133.5	111.5	107.1	105.2	107.8	111.3	118.7	-5.1
Rapid Deficit Reduction Program (billion \$)	-11.98	-22.17	-12.02	-8.00	-4.81	0.21	0.86	0.86	-45.07*
Government Budgetary Expenditures (current riyals)	216.0	216.5	160.1	137.1	123.2	106.1	108.1	115.4	-8.6
Total Government Expenditures	27.1	27.4	23.9	21.4	19.5	17.5	16.8	16.8	-6.6
Government Consumption	19.5	19.1	17.4	15.6	14.2	12.8	12.0	11.8	-6.9
Government Investment	7.5	8.2	6.5	5.8	5.3	4.7	4.8	5.0	-5.6
Military Expenditures	12.1	12.6	11.0	9.8	9.0	8.1	7.7	7.7	-6.3
Total Private Expenditures	30.1	31.3	30.5	29.0	27.8	26.3	25.5	25.2	-2.5
Private Consumption	23.7	24.9	24.2	23.1	22.2	21.3	20.8	20.8	-1.8
Private Investment	6.4	6.5	6.3	5.9	5.5	5.1	4.7	4.5	-4.9
Private/Government Expenditures	1.11	1.14	1.28	1.36	1.43	1.50	1.52	1.50	4.4
Inflation (Non-Oil Price Deflator)	-1.98	-2.18	-6.66	-3.19	-2.74	-3.49	0.80	1.70	-
Money Supply (M1)	14.1	14.4	12.6	11.7	11.2	10.4	10.5	10.8	-3.7
Non-Oil GDP	34.3	35.0	32.6	31.8	30.7	29.8	30.2	31.5	-1.2
Government Revenue (current riyals)	171.5	133.5	111.5	107.1	105.2	107.8	111.3	118.7	-5.1

* Notes: See text for oil market assumptions. Indicates summation over the 1986-1992 period

Table 10: Saudi Arabia: Private Sector Viability, 1986-1992, Alternative Fiscal Strategies, Balanced Budget Program, Fluctuating Oil Markets (Billion 1970 riyals)

	Actual 1985	Forecast								Average Annual Growth 1985 - 1991
		1986	1987	1988	1989	1990	1991	1992		
Slow Deficit Reduction (billion \$)										
Private Sector Output	-11.98	-13.09	-11.39	-10.12	-8.42	-7.57	-5.87	0.00	-56.46*	
Agriculture	26.46	25.45	24.31	23.29	22.42	21.85	21.43	20.71	-3.4	
Mining	1.72	1.87	1.93	1.99	2.04	2.09	2.12	2.16	2.8	
Manufacturing	0.24	0.25	0.24	0.22	0.21	0.20	0.20	0.19	-3.3	
Construction	1.99	1.98	1.97	1.92	1.88	1.84	1.81	1.78	-1.6	
Wholesale-Retail Trade	7.53	7.01	6.50	6.08	5.77	5.56	5.42	5.20	-5.2	
Transportation	4.71	4.63	4.46	4.25	4.04	3.87	3.73	3.56	-3.9	
Service	3.96	3.78	3.51	3.33	3.19	3.14	3.10	2.94	-4.2	
Ownership of Dwellings	1.40	1.26	1.21	1.16	1.12	1.09	1.08	1.04	-4.2	
Finance & Banking	2.35	2.23	2.11	2.01	1.92	1.85	1.80	1.72	-4.4	
Credit to Private Sector	2.43	2.44	2.39	2.32	2.26	2.21	2.18	2.12	-1.9	
Commercial Bank	10.09	9.56	9.00	8.74	8.60	8.60	8.62	8.54	-2.4	
Agricultural Credit	0.40	0.34	0.31	0.29	0.27	0.26	0.26	0.24	-7.0	
Rapid Deficit Reduction (billion \$)										
Private Sector Output	-11.98	-22.17	-12.02	-8.00	-4.81	0.12	0.86	0.86	-45.07*	
Agriculture	26.46	25.35	24.90	23.37	22.05	20.70	19.94	19.72	-4.1	
Mining	1.78	1.88	1.95	2.01	2.05	2.08	2.11	2.14	2.7	
Manufacturing	0.24	0.26	0.25	0.22	0.20	0.18	0.17	0.17	-4.8	
Construction	1.99	2.00	2.00	1.94	1.87	1.80	1.74	1.72	-2.1	
Wholesale-Retail Trade	7.53	7.28	6.67	6.11	5.65	5.21	4.97	4.89	-6.0	
Transportation	4.71	4.76	4.57	4.30	4.02	3.72	3.49	3.34	-4.8	
Services	3.96	4.03	3.62	3.28	3.05	2.81	2.75	2.81	-4.8	
Ownership of Dwellings	1.40	1.31	1.23	1.16	1.10	1.03	1.00	1.00	-4.7	
Finance & Banking	2.35	2.31	2.16	2.02	1.89	1.75	1.70	1.63	-5.1	
Credit to Private Sector	2.43	2.51	2.44	2.33	2.28	2.11	2.05	2.02	-2.6	
Commercial Bank	10.09	9.88	0.07	8.64	8.44	8.23	8.30	8.52	-2.4	
Agricultural Credit	0.40	0.36	0.32	0.29	0.26	0.23	0.23	0.23	-7.6	

* Notes: See text for oil market assumptions. Indicates summation over the 1986-1992 period

an annual rate of 3.4 percent per annum with the slow deficit reduction program, and 4.1 percent per annum with the more rapid deficit reduction program.

3. It is apparent, therefore, that reducing the accumulated deficit from annual deficits in the \$10 billion range to a targeted balance does have fairly high deflationary costs, in terms of reducing the incentives for private sector output — reducing the accumulated deficit from \$71.9 billion to \$45 billion raises the contraction of private sector output from 2.5 percent per annum to 4.1 percent per annum. Correspondingly, the decline in non-oil GDP increases from a stationary level to a decline of 1.2 percent per annum.

While the above results show the impact sustained levels of government expenditure have in maintaining private sector output and demand, a more dramatic illustration of this fact can be seen by comparing two significantly different fiscal strategies (Tables 11 and 12). The first strategy assumes relaxation of the constraints on governmental external borrowing — enabling the government (under the „Fluctuating Oil Revenue“ scenario) to run annual deficits in the \$25 billion range. The second strategy assumes that the government (for whatever reason) has decided to maintain the level of its foreign asset holdings, thus forcing a balanced budget in each year of the forecast period. The results of these simulations indicate that:

1. The major benefit of the high deficit program is a positive overall rate of expansion of non-oil GDP (1.3 percent per annum). Private sector standards of living (as proxied by the level of private consumption) are also stabilized. Private sector investment also suffers only a slight decline and is poised to expand in the 1990s on the assumption of improved oil markets.
2. In contrast, the costs of maintaining a balanced budget appear fairly high — with private consumption declining at an average annual rate of 2.1 percent and private investment at an average annual rate of 5.8 percent. Private sector output which showed only a slight reduction under the high deficit program now contracts at an average annual rate of 4.5 percent per annum.

Forecast implications

The main thrust of the analysis above has been to determine if the Saudi Arabian government during an era of falling oil revenues, will be able to maintain and even expand the scope of private sector activity initiated during the oil boom years. In general, the results indicated that without major changes in national priorities (in terms for example of the willingness of the government to initiate external borrowing) it is unlikely, given likely developments in the oil markets, that the private sector will be able to sustain positive overall rates of economic growth over the 1986-92 period.

It is clear, therefore, that despite vast amounts of public sector expenditure since 1973/74 the kingdom's fortunes remain inextricably linked with the world oil market. The Fourth Five Year Development Plan (1985-90) has run into a number of problems. Despite government budgetary deficits of around \$10 billion in 1983, 1984 and 1985 the plan's targets now seem extremely overly ambitious. Nevertheless it still provides a pointer to the direction in which the government wants to see the economy moving.

One of the basic messages of the plan is that the state having made massive investments in establishing a modern infrastructure, wants the private sector to shoulder

Table 11: Saudi Arabia: Macroeconomic Forecasts, 1986-1992, Contrasting Fiscal Strategies, Fluctuating Oil Markets (Billion 1970 riyals)

	Actual 1985	Forecast							Average Annual Growth 1985-1992
		1986	1987	1988	1989	1990	1991	1992	
High Budget Deficits (billion \$)	-11.98	-21.02	-21.06	-23.67	-23.76	-24.04	-23.98	-25.00	-162.53
Government Budgetary Expenditures (current riyals)	216.0	212.2	193.9	195.8	194.2	196.9	201.1	212.3	-0.2
Total Government Expenditures	27.1	27.1	25.8	25.4	25.0	25.0	25.1	25.6	-0.8
Government Consumption	19.5	19.0	18.2	17.8	17.5	17.4	17.4	17.7	0.9
Government Investment	7.5	8.1	7.5	7.6	7.6	7.6	7.7	8.0	0.9
Military Expenditures	12.1	12.5	11.9	11.7	11.6	11.5	11.5	11.8	-0.4
Total Private Expenditures	30.1	31.2	31.2	31.1	20.9	30.8	30.8	31.2	0.5
Private Consumption	23.8	24.8	24.8	24.7	24.7	24.6	24.7	25.1	0.8
Private Investment	6.3	6.5	6.4	6.3	6.2	6.1	6.1	6.1	-0.5
Private / Government Expenditures	1.11	1.13	1.21	1.22	1.24	1.23	1.23	1.22	1.4
Inflation (Non-Oil Price Deflator)	-1.96	-2.70	-1.97	0.43	-0.18	0.64	0.74	1.71	-0
Money Supply (M1)	14.1	14.3	13.7	13.7	13.7	13.7	13.8	14.1	0.0
Non-Oil GDP	34.3	34.8	34.3	34.8	35.3	35.8	36.5	37.6	1.3
Government Revenue (current riyals)	171.5	133.5	115.1	107.1	105.2	107.8	111.3	118.7	-5.1
Balanced Budget (billion \$)	-11.98	0.90	0.00	0.35	0.11	0.18	0.00	0.43	2.00*
Government Budgetary Expenditures (current riyals)	216.0	130.0	115.1	106.9	104.8	106.2	111.3	117.1	-3.3
Total Government Expenditures	27.1	22.2	19.5	17.7	16.7	16.2	16.2	16.4	-6.9
Government Consumption	19.5	16.7	14.5	13.0	12.0	11.5	11.3	11.3	-7.5
Government Investment	7.5	5.5	5.0	4.7	4.7	4.7	4.9	5.0	-5.6
Military Expenditures	12.1	10.2	9.0	8.1	7.7	7.4	7.4	7.5	-6.6
Total Private Expenditures	30.1	29.2	27.7	26.4	25.4	24.8	24.6	25.5	-2.3
Private Consumption	23.7	23.1	22.0	21.2	20.6	20.3	20.3	20.5	-2.1
Private Investment	6.4	6.1	5.7	5.2	4.8	4.5	4.3	4.2	-5.0
Private / Government Expenditures	1.11	1.38	1.42	1.49	1.52	1.53	1.52	1.55	4.9
Inflation (Non-Oil Price Deflator)	-1.98	-12.81	-1.91	-2.81	4.65	3.64	1.49	1.53	-
Money Supply (M1)	14.1	11.6	10.9	10.6	10.5	10.5	10.7	11.0	-3.5
Non-Oil GDP	34.3	30.7	29.3	29.5	29.7	30.3	31.2	32.0	-1.0
Government Revenue (current riyals)	171.5	133.5	115.1	107.1	105.2	107.8	111.3	118.7	-5.1

* Notes: See text for oil market assumptions. Indicates summation over 1986-1992 period

Table 12: Saudi Arabia: Private Sector Viability, 1986-1992, Alternative Fiscal Strategies, Budget Deficits, Fluctuating Oil Markets (Billion 1970 riyals)

	Actual 1985	Forecast							Average Annual Growth 1985-1992
		1986	1987	1988	1989	1990	1991	1992	
High Budget Deficits (billion \$)	-11.98	-21.02	-21.06	-23.67	-23.76	-24.04	-23.98	-25.00	-162.53*
Private Sector Output	26.46	26.24	25.79	25.58	25.43	25.40	25.50	25.85	-3.0
Agriculture	1.78	1.87	1.96	2.04	2.11	2.18	2.25	2.32	3.9
Mining	0.24	0.26	0.26	0.26	0.26	0.25	0.25	0.26	1.2
Manufacturing	1.99	2.00	2.02	2.02	2.01	2.00	2.01	2.03	0.3
Construction	7.53	7.25	6.95	6.79	6.68	6.63	6.63	6.72	-1.6
Wholesale-Retail Trade	4.71	4.74	4.69	4.63	4.58	4.54	4.53	4.56	-0.5
Transportation	3.96	4.00	3.87	3.84	3.82	3.82	3.85	3.93	-0.1
Services	1.40	1.30	1.28	1.28	1.27	1.26	1.27	1.29	-1.2
Ownership of Dwellings	2.35	2.30	2.24	2.21	2.19	2.17	2.17	2.19	-1.0
Finance & Banking	2.43	2.50	2.51	2.52	2.52	2.52	2.53	2.56	0.7
Credit to Private Sector									
Commercial Bank	10.09	9.84	9.39	9.27	9.22	9.24	9.33	9.52	-0.8
Agricultural Credit	0.40	0.36	0.35	0.34	0.34	0.33	0.34	0.34	-2.3
Balanced Budget (billion \$)	-11.98	0.90	0.00	0.35	0.11	0.18	0.00	0.43	2.0*
Private Sector Output	26.46	23.89	22.07	20.73	19.84	19.33	19.16	19.22	-4.5
Agriculture	1.78	1.84	1.90	1.93	1.97	1.99	2.02	2.05	2.0
Mining	0.24	0.22	0.20	0.18	0.17	0.17	0.17	0.17	-4.8
Manufacturing	1.99	1.94	1.87	1.80	1.74	1.70	1.68	1.68	-2.4
Construction	7.53	6.53	5.80	5.29	4.98	4.80	4.74	4.75	-6.4
Wholesale-Retail Trade	4.71	4.42	4.09	3.78	3.52	3.33	3.21	3.15	-5.6
Transportation	3.96	3.35	3.00	2.82	2.75	2.74	2.70	2.86	-4.5
Services	1.40	1.17	1.09	1.03	1.00	0.98	0.98	0.99	-4.8
Ownership of Dwellings	2.35	2.08	1.92	1.78	1.67	1.61	1.58	1.57	-5.6
Finance & Banking	2.43	2.32	2.20	2.10	2.04	2.00	1.99	1.00	-2.7
Credit to Private Sector									
Commercial Bank	10.09	9.01	8.46	8.28	8.21	8.25	8.38	8.54	-2.4
Agricultural Credit	0.40	0.30	0.26	0.24	0.22	0.22	0.22	0.22	-8.2

* Notes: See text for oil market assumptions. Indicates summation over the 1986-1992 period

more of the investment burden, and eventually to emerge as the main force in the economy. The forecasts above show that under fairly conservative assumptions concerning oil revenues and government deficits there may be fairly buoyant private sector demand (presumably based on past savings). If this is in fact the case, a key area for private sector growth is in non-oil industrial activity. Currently there are about 2,000 producing industries representing a total investment of about SR 60,000 million (\$16 billion).³² Given that local output currently accounts for only 15 percent of goods consumed in the kingdom — the rest being imported, there is room for expansion. Imports were widely expected to fall by about 30 percent in 1986 which in turn was down by 28 percent from 1984. Given relatively buoyant demand on the part of the private sector, greater shifts toward local manufacturers might be possible than anticipated by the forecasts above. If this is in fact the case, the overall rates of private sector output should be more in line with that of private sector demand.

Conclusions

The pattern of industrialization and technology transfer in Saudi Arabia has resulted in an economic structure in which:³³

1. The imported heavy industrial plants have a low labor absorptive capacity.
2. The sectoral distribution of the labor force has been skewed in favor of the tertiary sector at a very early stage of economic development.
3. Increases in the size of employment in the tertiary sector, when preceding the growth of the commodity sectors, do not reflect actual economic needs; rather they indicate unsuitable technical and investment policies in other sectors.

Several conclusions concerning Saudi Arabia's industrial strategy are apparent:

1. Oil revenues have provided the key to development in Saudi Arabia, but finance alone is no guarantee of economic success. Important requirements for development are labor, management skills, technology, land and above all, organization. This is especially vital given the scale and pace of development underway in the kingdom.
2. An abundance of fixed capital or at least the means to acquire it, serves only to emphasize the scarcity of other resources in the kingdom, notably the shortage of indigenous labor and the absence of skills to run new industries.
3. Given likely movements in world petroleum markets the country would be wise to shift its industrialization strategy away from dependence on low growth export markets, reorienting it toward higher growth domestic consumption good industries.

32 „Saudi Arabia: Revival Predicted by Early 1990s," *Middle East Economic Digest* (December 20, 1986), p. 60.

33 See also N. El-Shishini, „Impact of Technical Change on the Structure of the Labor Force in the ECWA Region," in A.B. Zahlan, ed., *Technology Transfer and Change in the Arab World: A Seminar of the United Nations Economic Commission for Western Asia* (New York: Pergamon Press, 1978), p. 208.